RuggedSwitch™
RS500

Installation Guide

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Federal Communications Commission Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and cad radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference on his own expense.

Warning: Changes or modifications not expressly approved by RuggedCom Inc. could void the user's authority to operate the equipment.

Trademarks:

Ethernet *is a trademark of Xerox Corporation*
RuggedSwitch *is a registered trademark of RuggedCom Inc.*

Important:

The RS500 contains no user serviceable parts. Attempted service by unauthorized personnel shall render all warranties null and void.

The RS500 should be installed in a **restricted access location** where access can only be gained by service personnel or users who have been instructed about the reasons for the restrictions applied to the location and about any precautions that shall be taken; and access is through the use of a tool or lock and key, or other means of security, and is controlled by the authority responsible for the location.

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1 Product Overview

1.1 Functional Overview

The **RuggedSwitch™** RS500 is a substation hardened, fiber optical Ethernet switch specifically designed to operate in harsh environments such as those found in electric utility substations and harsh industrial environments. The RS500 provides 4 10BaseFL fiber optical ports and one 100BaseFX port.

Specifically tested to the same standards as mission critical protective relaying equipment (i.e. ANSI/IEEE C37.90 and IEC 60255) the RS500 is ideally suited to form the Ethernet network in a UCA2 (Utility Communications Architecture 2.0) based substation automation network. Because the RS500 was designed to meet the demands of the substation environment it is also ideally suited for industrial automation networks based on Industrial Ethernet. The reliability of the RS500 exceeds that of commercial Ethernet switches by having no rotating mechanical parts such as cooling fans and by utilizing high-temperature solid-state components.

1.2 Feature Highlights

- Utility Grade (i.e. substation hardened) per ANSI/IEEE C37.90, IEC 60255, and the new IEC 61850-3 (2002), IEC 61000-6-5 standards
- Operating temperature: -40° to 85°C (no fan)
- Radiated RF Immunity: 35V/m per ANSI/IEEE C37.90.2
- Power supply options: 24VDC, 48VDC or 110VDC
- Failsafe output relay for critical failure or error alarming
- 4 – 10BaseFL (10Mbps) multimode
- 1 – 100BaseFX fiber optical port
- Full-duplex operation (no collisions)

1.3 RS500 Front Panel Description

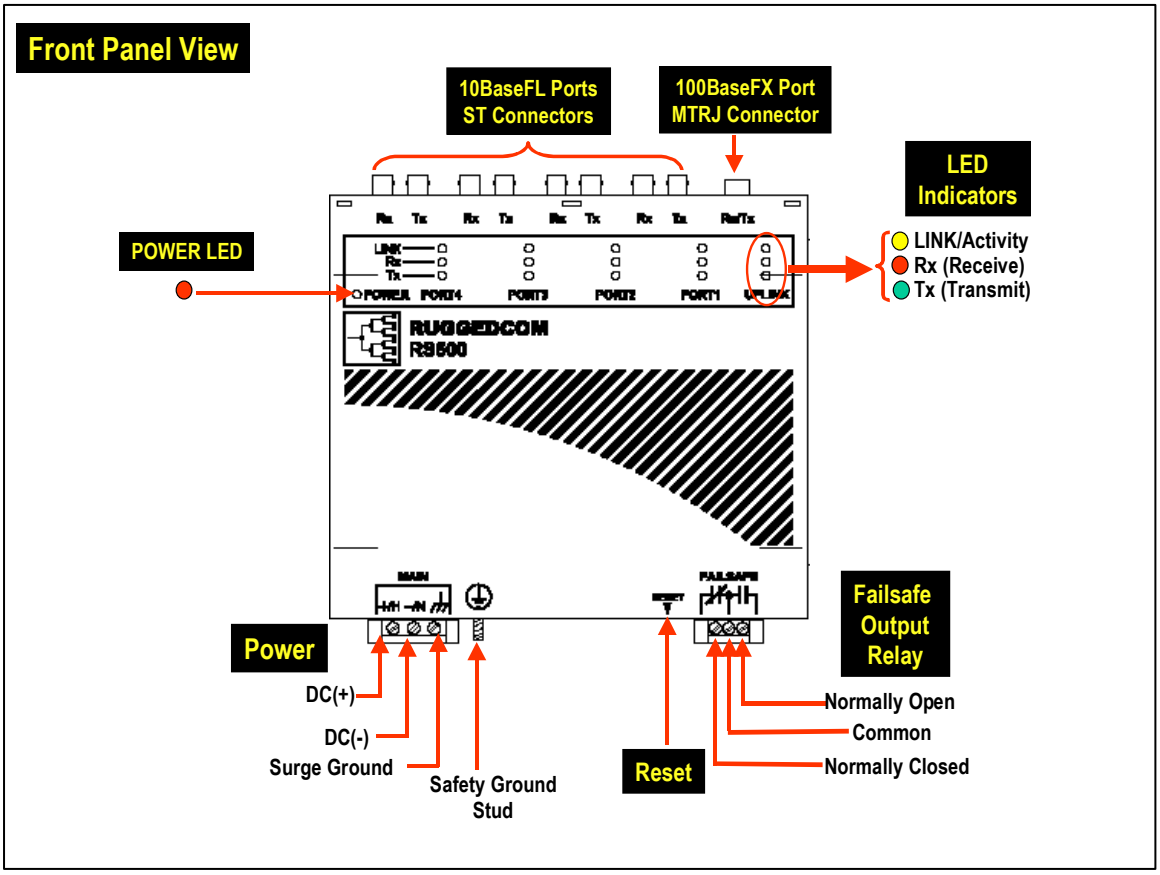


Fig. 1.3.1 RS500 Front Panel Detail

ITEM	Activity	Comments
LINK LED (Yellow)	Solid	Link Established
	Blinking – Once per second	Tx, Rx Activity
Tx LED (Red)	Blinking	Tx (Transmit) Activity
Rx LED (Green)	Blinking	Rx (Receive) Activity
POWER LED (Red)	Solid	Power On

1.4 RS500 Top and Bottom View

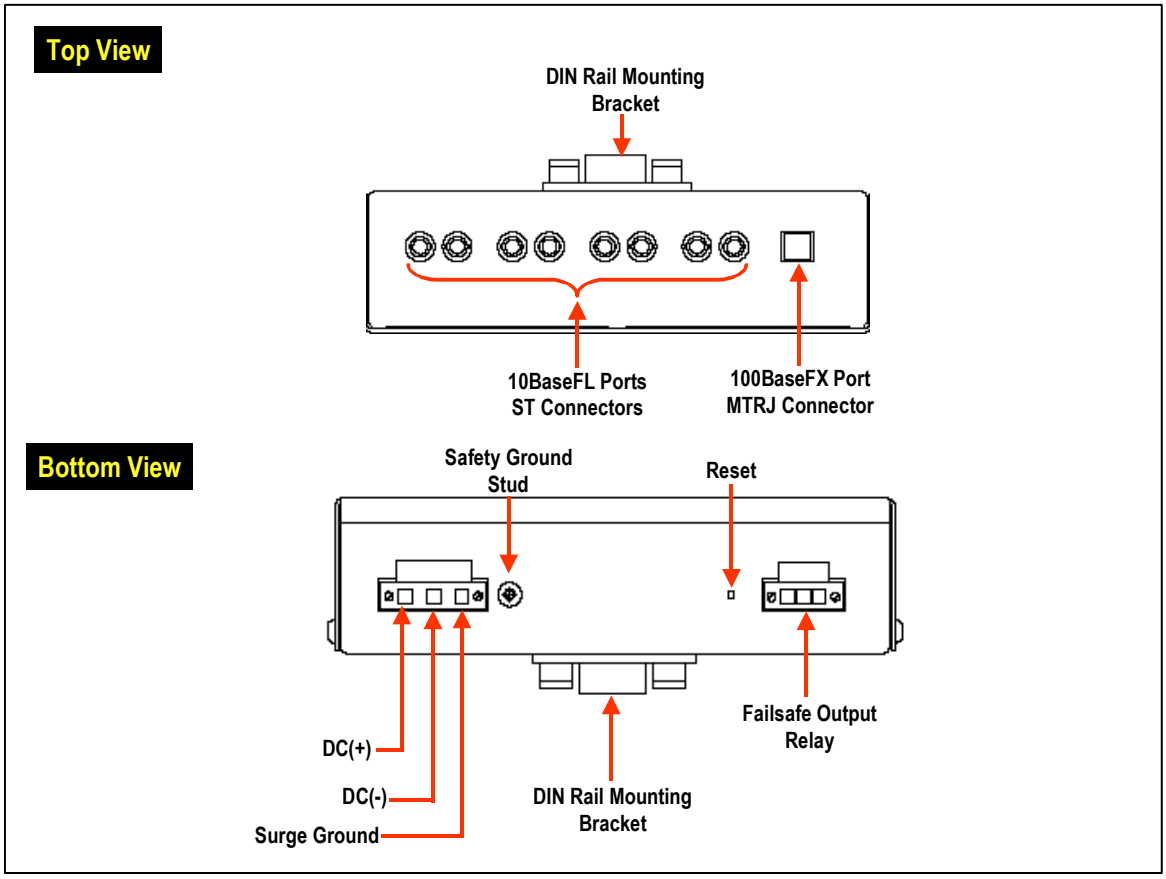


Fig. 1.4.1 RS500 Top and Bottom View

2 Installation

2.1 DIN Rail Mounting

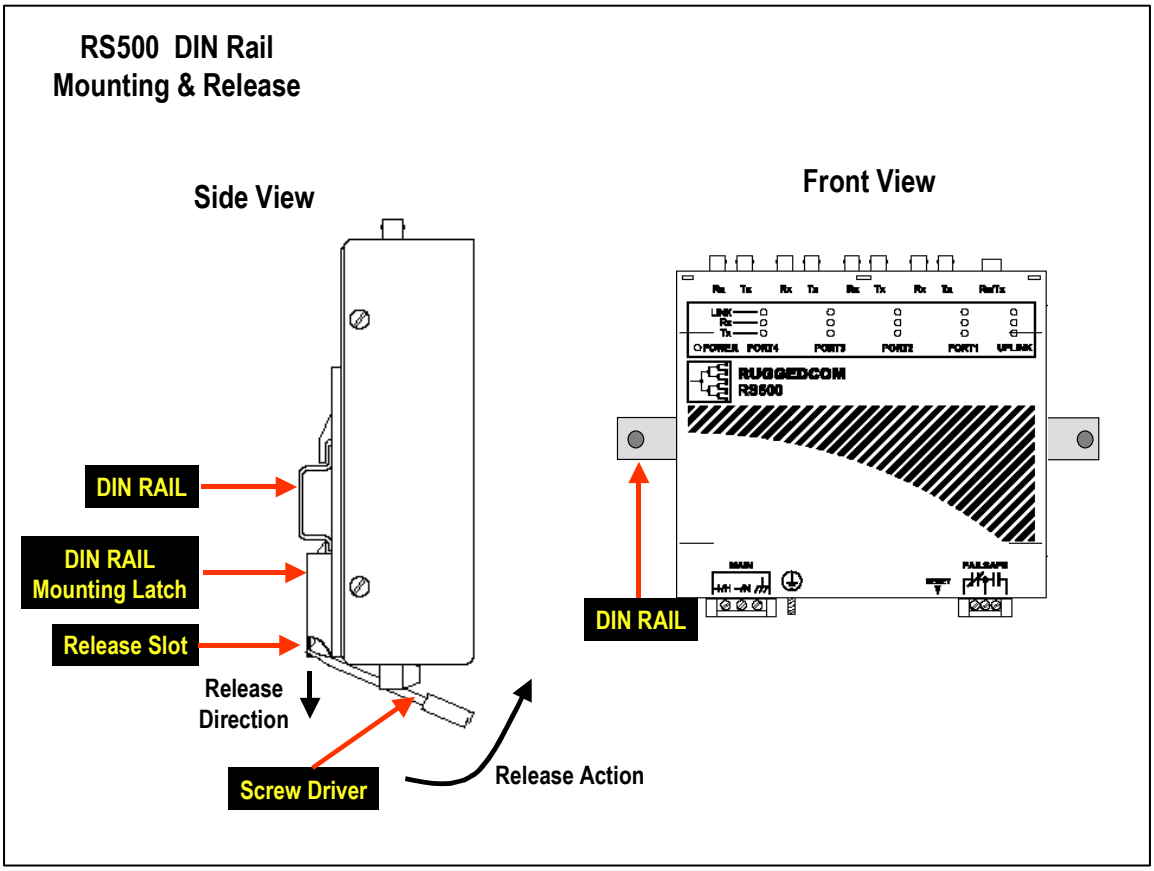


Fig. 2.1.1 RS500 Rail Mounting

2.2 Power Supply Wiring and Grounding

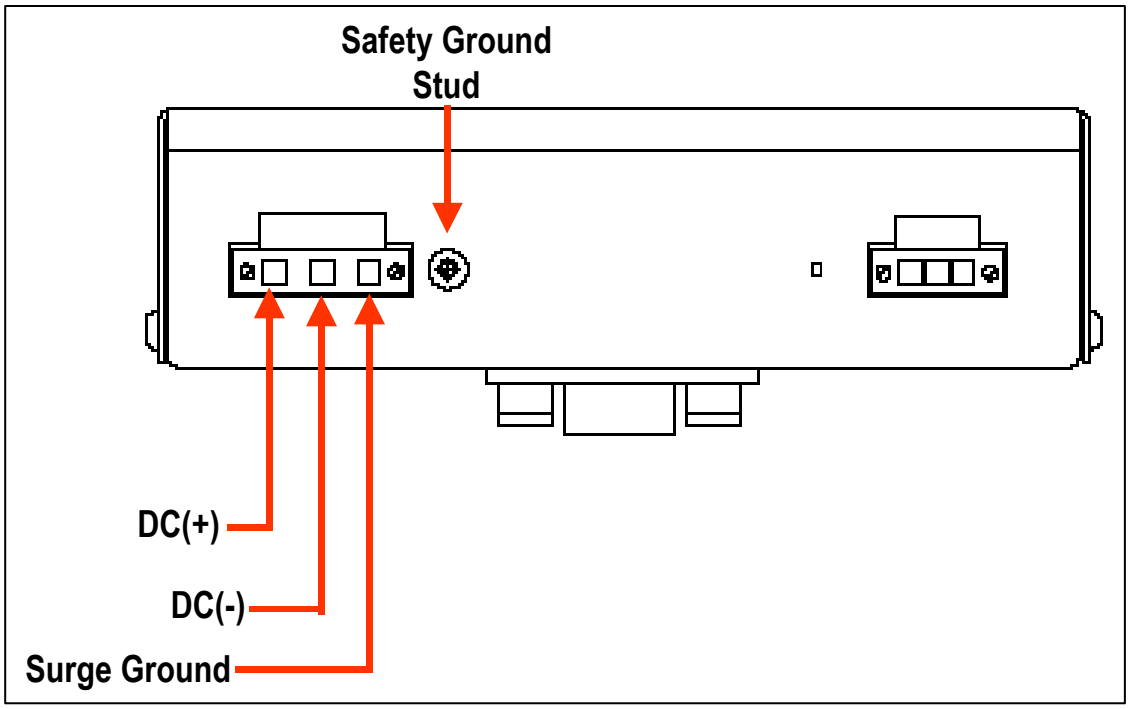


Fig. 2.2.1 RS500 Power Supply Inputs

The power supply input is connected as follows:

1. **+** = DC (+) is connected to the positive (+) terminal if the power source is DC or to the (Hot) terminal if the power source is AC.
2. **-** = DC (-) is connected to the negative (-) terminal if the power source is DC or to the (Neutral) terminal if the power source is AC.
3. **Surge Ground** is used as the ground conductor for all surge and transient suppression circuitry internal to the RS500. Surge Ground is connected directly to the safety ground terminal internally.

*NOTE: Since the Chassis Ground is connected to the equipment ground bus internally, HIPOT testing **cannot** be performed in the field.*

2.2.1 Power Supply - DC Input

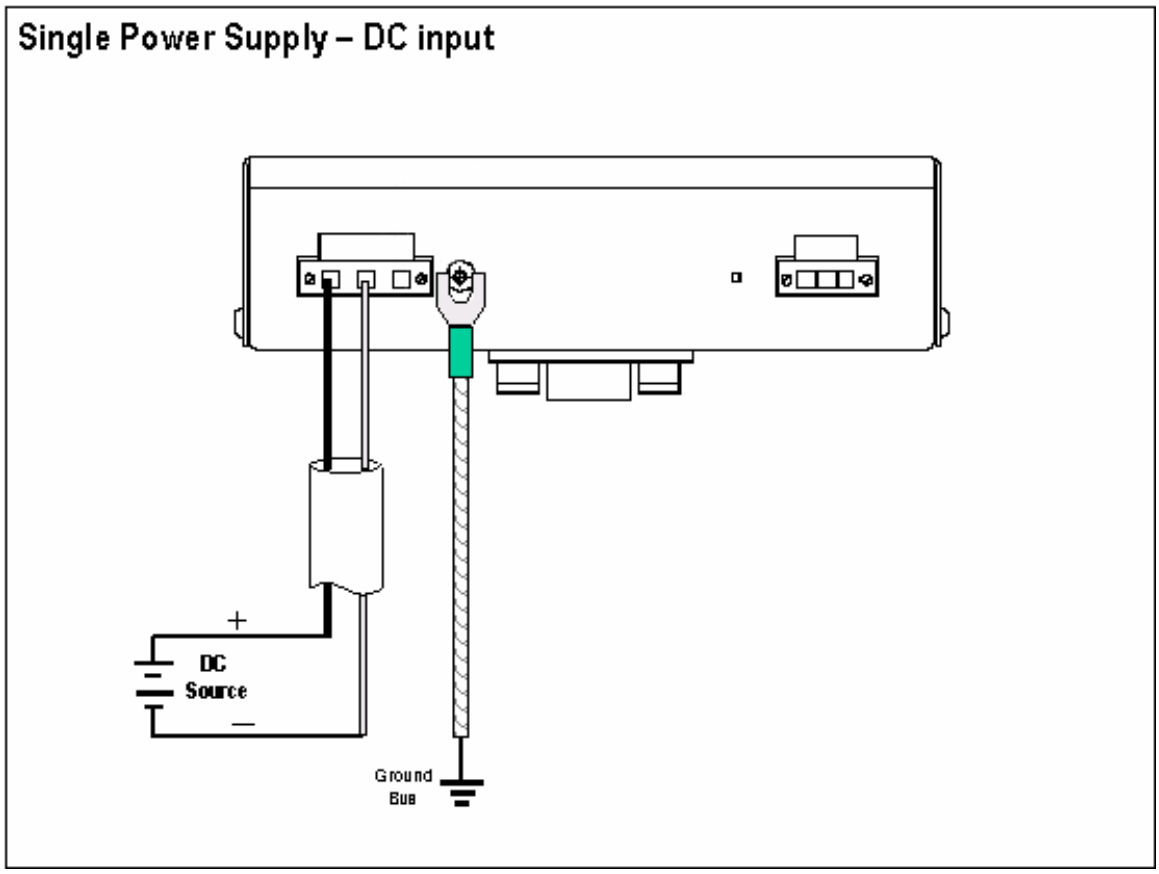


Fig. 2.2.2 Power Supply – DC Input

Note: Ground bus can either be connected to the Ground Stud on the rear of the RS500 chassis, or the Surge Ground port on the screw-in terminal block.

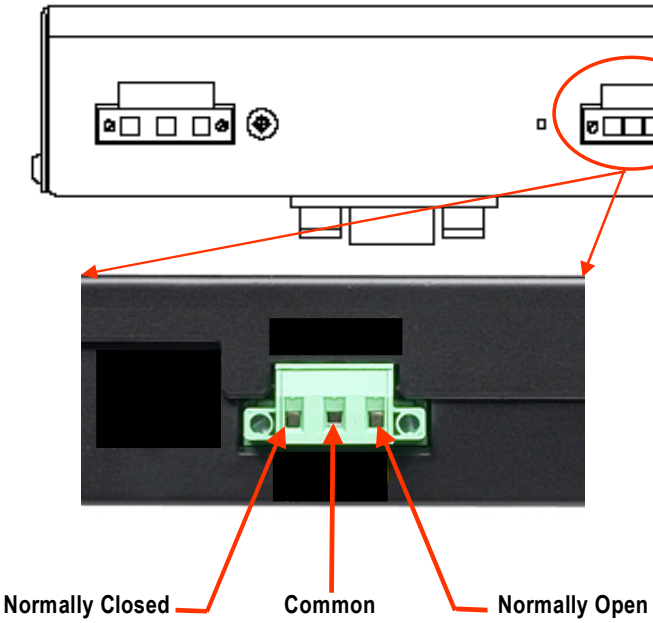
2.3 HIPOT (Dielectric Strength) Testing

HIPOT Dielectric strength testing **cannot** be performed in the field due to transient/surge suppression circuitry connected to the RS500 Surge/Chassis Ground. All RuggedSwitch products are HIPOT tested according to IEC 60255-5 (Section 6) during final test.

2.4 Failsafe Output Wiring and Specifications

The “Failsafe” output relay is provided to signal critical error conditions that may occur on the RS500. The contacts are energized upon power up of the unit and remain energized until a critical error occurs.

RS500 Failsafe Relay Outputs



***** Normal contact state prior to power being applied to unit. *****

3 Technical Specifications

3.1 Power Supply Specifications

Power Supply Type	Minimum Input	Maximum Input	Fuse Rating	Maximum Power Consumption
24 VDC	18 VDC	36 VDC	5A(F)	10 W
48 VDC	36 VDC	59 VDC	3.15A(T)	
HI (110 VDC)	88 VDC	150 VDC	3.15A(T)	

NOTES:

1. (T) denotes time-delay fuse
2. For continued protection against risk of fire, replace only with same type and rating of fuse.

3.2 Failsafe Relay Specifications

Parameter	Value (Resistive)
Max Switching Voltage	30VAC, 80VDC
Rated Switching Current	0.3A @ 30VAC 1A @ 30VDC, 0.3A @ 80VDC

3.3 Networking Standards Supported

Parameter	10Mbps Ports	100Mbps Ports	Notes
IEEE 802.3	✓		10BaseT / 10BaseFL
IEEE 802.3u		✓	100BaseTX / 100BaseFX
IEEE 802.3x	✓	✓	Full Duplex Operation

3.4 Fiber Optical Specifications

Parameter	Ports 1 to 4 10Mbps Ports		Uplink 100Mbps Port	
	Multi-Mode	Single-Mode*	Multi-Mode	Single-Mode*
Speed Standard	10BaseFL		100BaseFX	
Connector Type	ST		MTRJ	LC
Segment Length	2 km	15 km	2 km	15 km
Optical Wavelength	820nm	1310nm	1300nm	1310nm
Cable Size Core/Cladding	62.5/125µm	9/125µm	62.5/125µm	9/125µm
Optical Tx Power Min/Max (dBm Peak)	-13.5/-7.6	-23/-15	-16/-11	-15/-8
Optical Rx Sensitivity (dBm Average)	-34.4	-38	-33.5	-31
Max Optical Rx Power (dBm Peak)	-8.2	-3.0	-11	-5
Typical Optical Power Budget (dB)	22	18	17	16.5

* Available as an option

3.5 Networking Performance Specifications

Parameter	10Mbps Ports (10BaseFL)	100Mbps Ports (100BaseFX)	Notes
Latency	16us + frame time	5us + frame time	
Filtering Rate	14 880	148 800	Frames/sec
MAC Address Table	8192		
VLAN Address Table	4096		

3.6 Type Test Specifications

Electrical Safety	Levels	Comments
Dielectric Withstand	2 kV rms for 1 minute	ANSI/IEEE C37.90 (1989) IEC 60255-5 (Section 6)
High Voltage Impulse	5 kV peak	IEC 60255-5 (Section 8)
Insulation Resistance	500 VDC for 1 minute	IEC 60255-5 (Section 6

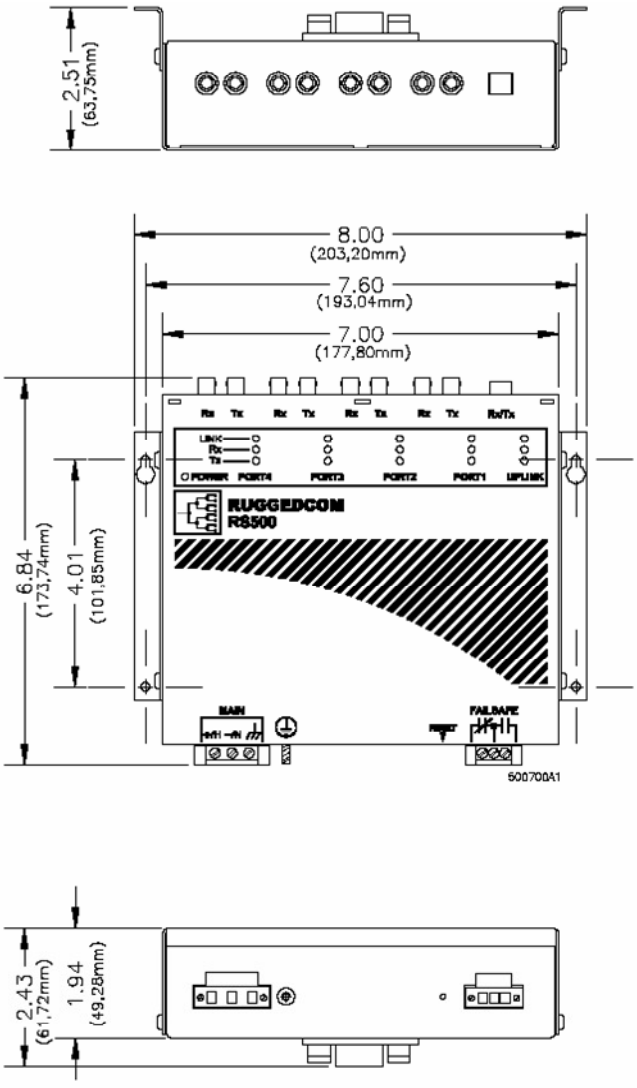
Electrical Environment	Levels	Comments
High Frequency Disturbance (Oscillatory)	2.5 kV @ 1MHz for 2s	ANSI/IEEE C37.90.1 IEC 60255-22-1
IEC Surge	4 kV / 2 kV	IEC 61000-4-5 (Level 4)
IEC Fast Transient	2 kV / 1 kV	IEC 61000-4-4 (Level 4)
ANSI/IEEE Fast Transient	4 kV	ANSI/IEEE C37.90.1
IEC Radiated RFI Immunity	10 V/m	IEC 61000-4-3
ANSI/IEEE Radiated RFI Immunity	35 V/m	ANSI/IEEE C37.90.2
ESD (Electrostatic Discharge)	15 kV (air discharge) 8 kV (contact)	IEC 61000-4-2 (Level 4)

Atmospheric Environment	Levels	Comments
Temperature (Dry Cold)	-40°C	IEC 60068-2-1 Test Ad: 16 hrs @ -40°C
Temperature (Dry Heat)	85°C	IEC 60068-2-2 Test Bd: 16 hrs @ 85°C
Humidity	95% Non-condensing	IEC 60068-2-30 Test Db: 6 cycles, 55°C, 95% Humidity

3.7 Operating Environment

Parameter	Range	Comments
Ambient Operating Temperature	-40 to 85°C	Ambient Temperature as measured from a 30cm radius surrounding the center of the R500 enclosure.
Ambient Relative Humidity	5% to 95%	Non-condensing
Ambient Storage Temperature	-40 to 85°C	

3.8 Physical Dimensions



Parameter	Value	Comments
Dimensions	8.0 x 6.84 x 2.43 inches (203,20) x (173,74) x (61,72) mm	(Length x Width x Height) with mounting brackets installed
Weight	5 lb (2.25 Kg)	
Enclosure	18 gauge Galvanized Steel	

3.9 Agency Approvals

Agency	Standards	Comments
cCSAus, CE	CSA C22.2 No. 60950, UL 60950, EN 60950 EN 61000-6-2	Approved
FCC	FCC Part 15, Class A	Approved

4 Warranty

RuggedCom warrants this product for a period of five (5) years from date of purchase. For warranty details, visit http://www.ruggedcom.com/ or contact your customer service representative.

Should this product require warranty or service contact the factory at:

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